

WHAT IS CLAIMED IS:

1. A microchemical chip comprising a substrate provided with a channel through which a fluid to be treated flows, in which a predetermined treatment is performed with respect to the fluid to be treated flowing through the channel,

wherein the substrate is made of a ceramic material.

2. The microchemical chip of claim 1, wherein the substrate comprises a supply portion from which a fluid to be treated is poured into the channel, and a collection portion from which the treated fluid is drawn to the outside, and

the fluid to be treated is poured from the supply portion to the channel, and the predetermined treatment is performed to the poured fluid to be treated, and then the treated fluid is drawn from the collection portion to the outside.

3. The microchemical chip of claim 1, wherein the substrate comprises a plurality of supply portions from which a plurality of fluids to be treated are poured into the channel, respectively, and a collection portion from which the treated fluids are drawn to the outside, and

the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, the plurality of fluids poured are merged and subjected to the predetermined treatment, and then the treated fluids are drawn from the collection portion to the outside.

4. A microchemical chip comprising a substrate provided with a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, wherein the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment,

wherein the channel has a turbulent flow generating portion on a downstream side in a flowing direction of the fluid to be treated from a position where the supply portions are connected.

5. The microchemical chip of claim 4, wherein the turbulent flow generating portion is a hydrophilic portion having a hydrophilic wall surface.

6. The microchemical chip of claim 4, wherein the turbulent flow generating portion is a hydrophobic portion having a hydrophobic wall surface.

7. The microchemical chip of claim 4, wherein the turbulent flow generating portion is a bend portion.

8. The microchemical chip of claim 7, wherein the bend portion of the channel is formed by coupling a plurality of channels having a different distance from the substrate surface with a channel extending in a direction perpendicular to the substrate surface.

9. The microchemical chip of claim 4, wherein the turbulent flow generating portion is an uneven portion having an uneven wall surface.

10. The microchemical chip of claim 4, wherein the substrate further comprises a collection portion connected to the channel and from which a treated fluid is drawn to the outside, and

wherein the turbulent flow generating portion is provided on the downstream side in the flowing direction of the fluid to be treated from the position in which the supply portions are connected and on an upstream side in

the flowing direction of the fluid to be treated from a position in which the collection portion is connected, and

the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to the predetermined treatment, and then the treated fluid is drawn from the collection portion to the outside.

11. The microchemical chip of claim 10, wherein the turbulent flow generating portion is a hydrophilic portion having a hydrophilic wall surface.

12. The microchemical chip of claim 10, wherein the turbulent flow generating portion is a hydrophobic portion having a hydrophobic wall surface.

13. The microchemical chip of claim 10, wherein the turbulent flow generating portion is a bend portion.

14. The microchemical chip of claim 13, wherein the bend portion of the channel is formed by coupling a plurality of channels having a different distance from the substrate surface with a channel extending in a direction perpendicular to the substrate surface.

15. The microchemical chip of claim 10, wherein the turbulent flow generating portion is an uneven portion having an uneven wall surface.

16. The microchemical chip of claim 4, wherein the substrate comprises a treatment portion in which the predetermined treatment is performed to the merged fluids on the downstream side in a flowing direction of the fluid to be treated from the position in which the supply portions are connected to the channel, and

wherein the turbulent flow generating portion is provided on the downstream side in the flowing direction of the fluid to be treated from the position in which the supply portions are connected and on an upstream side in the flowing direction of the fluid to be treated from the treatment portion.

17. The microchemical chip of claim 16, wherein the turbulent flow generating portion is a hydrophilic portion having a hydrophilic wall surface.

18. The microchemical chip of claim 16, wherein the turbulent flow generating portion is a hydrophobic portion having a hydrophobic wall surface.

19. The microchemical chip of claim 16, wherein the turbulent flow generating portion is a bend portion.

20. The microchemical chip of claim 19, wherein the bend portion of the channel is formed by coupling a plurality of channels having a different distance from the substrate surface with a channel extending in a direction perpendicular to the substrate surface.

21. The microchemical chip of claim 16, wherein the turbulent flow generating portion is an uneven portion having an uneven wall surface.

22. A microchemical chip comprising a substrate provided with a channel through which a fluid to be treated flows, and in which a predetermined treatment is performed with respect to the fluid to be treated flowing through the channel,

wherein the channel is formed by covering one surface of a substrate main body, on one surface of which a groove portion is formed, with a covering portion, and at least the substrate main body is made of a ceramic material.

23. The microchemical chip of claim 22, wherein the substrate comprises a supply portion from which a fluid to be treated is poured into the channel, and a collection portion from which the treated fluid is drawn to the outside, and

the fluid to be treated is poured from the supply portion to the channel, the predetermined treatment is performed to the poured fluid to be treated, and then the treated fluid is drawn from the collection portion to the outside.

24. The microchemical chip of claim 22, wherein the substrate comprises a plurality of supply portions from which a plurality of fluids to be treated are poured into the channel, respectively, and a collection portion from which the treated fluids are drawn to the outside, and

the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, and then the treated fluids are drawn from the collection portion to the outside.

25. A microchemical chip comprising a substrate provided with a channel through which a fluid to be treated flows

and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, wherein the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment,

wherein a vibrating element is provided in a vicinity of a position in which the channel is connected to the supply portion.

26. The microchemical chip of claim 25, wherein the substrate comprises a substrate main body in which a groove portion is formed and a covering member provided such that the groove portion is covered, and the channel is formed by covering the groove portion formed in the substrate main body with the covering member, and

the vibrating element is provided in the covering member at a position corresponding to an inner surface of a channel portion in a vicinity of a position in which the supply portions are connected on a downstream side in a flowing direction of a fluid to be treated from that position.

27. The microchemical chip of claim 25, wherein the



substrate further comprises a collection portion connected to the channel and from which a treated fluid is drawn to the outside, and

wherein the vibrating element is provided on the downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected and on an upstream side in the flowing direction of the fluid to be treated from a position in which the collection portion is connected, and

the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to the predetermined treatment, and then the treated fluid is drawn from the collection portion to the outside.

28. The microchemical chip of claim 26, wherein the substrate comprises a treatment portion in which the predetermined treatment is performed to the merged fluids on the downstream side in the flowing direction of the fluid to be treated from a position in which the supply portions are connected to the channel, and

wherein the vibrating element is provided on the downstream side in the flowing direction of the fluid to be treated from the position in which the supply portions

are connected and on an upstream side in the flowing direction of the fluid to be treated from the treatment portion.

29. The microchemical chip of claim 27, wherein the substrate comprises a treatment portion in which the predetermined treatment is performed to the merged fluids on the downstream side in the flowing direction of the fluid to be treated from a position in which the supply portions are connected to the channel, and

wherein the vibrating element is provided on the downstream side in the flowing direction of the fluid to be treated from the position in which the supply portions are connected and on an upstream side in the flowing direction of the fluid to be treated from the treatment portion.

30. A method for producing a microchemical chip including a substrate provided with a channel through which a fluid to be treated flows, and in which a predetermined treatment is performed to the fluid to be treated flowing through the channel, comprising:

forming a groove portion by pressing a surface of a ceramic green sheet with a pattern having a predetermined shape;

laminating another ceramic green sheet on the surface of the ceramic green sheet in which the groove portion is formed in such a manner that the groove portion is covered; and

sintering the laminated ceramic green sheets at a predetermined temperature to form the substrate.

31. The method for producing a microchemical chip of claim 30, wherein, when forming the substrate by sintering a laminate including at least three ceramic green sheets to cure the laminate, the method comprises:

forming groove portions by pressing a surface of each of at least two ceramic green sheets with a pattern having a predetermined shape and forming as appropriate a through-hole for communicating the groove portions formed in the different ceramic green sheets;

laminating another ceramic green sheet on a surface of the ceramic green sheets in which the groove portions are formed in such a manner that the groove portions are covered; and

sintering the laminated ceramic green sheets at a predetermined temperature so as to form the substrate.

32. A method for producing a microchemical chip including a substrate provided with a channel through

which a fluid to be treated flows, and in which a predetermined treatment is performed to the fluid to be treated flowing through the channel, comprising:

forming a groove portion by pressing a surface of a ceramic green sheet with a pattern having a predetermined shape;

sintering the ceramic green sheet in which the groove portion is formed at a predetermined temperature to form a substrate main body, and

covering the groove portion on the substrate main body with a covering portion to form the substrate.

33. The method for producing a microchemical chip of claim 32, wherein, when forming the substrate main body by sintering a laminate including a plurality of ceramic green sheets, the method comprises:

forming groove portions by pressing a surface of each of at least two ceramic green sheets with a pattern having a predetermined shape and forming as appropriate a through-hole for communicating the groove portions formed in the different ceramic green sheets;

laminating another ceramic green sheet on the surface of the ceramic green sheets in which the groove portions are formed in such a manner that the groove portions are covered; and

sintering the laminated ceramic green sheets at a predetermined temperature to form the substrate main body.

34. A method for producing a microchemical chip including a substrate in which a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, are formed, and the channel has a hydrophilic portion having a hydrophilic wall surface on a downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected, wherein the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, comprising:

forming a groove portion by pressing a surface of a ceramic green sheet with a pattern having a predetermined shape;

sintering the ceramic green sheet in which the groove portion is formed at a predetermined temperature so as to form a substrate main body;

in the case where the substrate main body is hydrophilic,

covering a wall surface desired to be hydrophilic of the wall surface of the groove portion with a protective film, performing a treatment for providing hydrophobicity to the wall surface excluding the desired wall surface, and removing the protective film, so as to provide hydrophilicity to the desired wall surface, and

in the case where the substrate main body is hydrophobic,

covering portions excluding a wall surface desired to be hydrophilic of the wall surface of the groove portion with a protective film, performing a treatment for providing hydrophilicity to the desired wall surface, and removing the protective film, so as to provide hydrophilicity to the desired wall surface; and

covering the groove portion on a surface of the substrate main body with a covering member so as to form the substrate.

35. A method for producing a microchemical chip including a substrate in which a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, are formed, and the channel has a hydrophobic portion having a hydrophobic wall surface on a

downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected, wherein the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, comprising:

forming a groove portion by pressing a surface of a ceramic green sheet with a pattern having a predetermined shape;

sintering the ceramic green sheet in which the groove portion is formed at a predetermined temperature so as to form a substrate main body;

in the case where the substrate main body is hydrophilic,

covering portions excluding a wall surface desired to be hydrophobic of the wall surface of the groove portion with a protective film, performing a treatment for providing hydrophobicity to the desired wall surface, and removing the protective film, so as to provide hydrophobicity to the desired wall surface, and

in the case where the substrate main body is hydrophobic,

covering a wall surface desired to be hydrophobic of the wall surface of the groove portion with a protective

film, performing a treatment for providing hydrophilicity to portions excluding the desired wall surface, and removing the protective film, so as to provide hydrophobicity to the desired wall surface; and

covering the groove portion on a surface of the substrate main body with a covering member so as to form the substrate.

36. A method for producing a microchemical chip including a substrate in which a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, are formed, and the channel has a bend portion on a downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected, wherein the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, comprising:

forming groove portions by pressing a surface of each of at least two ceramic green sheets with a pattern having a predetermined shape and forming as appropriate a through-hole for communicating the groove portions formed



in the different ceramic green sheets;

laminating another ceramic green sheet on the surface of the ceramic green sheets in which the groove portions are formed in such a manner that the groove portions are covered, and that the groove portions formed in the different ceramic green sheets are communicated through the through-hole; and

sintering the laminated ceramic green sheets at a predetermined temperature so as to form the substrate.

37. A method for producing a microchemical chip including a substrate in which a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, are formed, and the channel has a bend portion on a downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected, wherein the plurality of fluids to be treated are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, comprising:

forming groove portions by pressing a surface of each of at least two ceramic green sheets with a pattern

having a predetermined shape and forming as appropriate a through-hole for communicating the groove portions formed in the different ceramic green sheets;

laminating another ceramic green sheet on the surface of the ceramic green sheets in which the groove portions are formed in such a manner that the groove portions are covered, and that the groove portions formed in the different ceramic green sheets are communicated through the through-hole;

sintering the laminated ceramic green sheets at a predetermined temperature to form a substrate main body; and

covering the groove portion on the substrate main body with a covering portion so as to form the substrate.

38. A method for producing a microchemical chip including a substrate in which a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, are formed, and the channel has an uneven portion having an uneven wall surface on a downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected, wherein the plurality of fluids to be treated

are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, comprising:

forming a groove portion and forming unevenness in a predetermined wall surface of the groove portion by pressing a surface of a ceramic green sheet with a pattern having a predetermined shape;

laminating another ceramic green sheet on a surface of the ceramic green sheet in which the groove portion is formed in such a manner that the groove portion is covered; and

sintering the laminated ceramic green sheets at a predetermined temperature so as to form the substrate.

39. A method for producing a microchemical chip including a substrate in which a channel through which a fluid to be treated flows and a plurality of supply portions connected to the channel and from which a plurality of fluids to be treated are poured into the channel, respectively, are formed, and the channel has an uneven portion having an uneven wall surface on a downstream side in a flowing direction of the fluid to be treated from a position in which the supply portions are connected, wherein the plurality of fluids to be treated

are poured from the plurality of supply portions into the channel, respectively, and the plurality of fluids poured are merged and subjected to a predetermined treatment, comprising:

forming a groove portion and forming unevenness on a predetermined wall surface of the groove portion by pressing a surface of a ceramic green sheet with a pattern having a predetermined shape;

sintering the ceramic green sheets in which the groove portion is formed at a predetermined temperature so as to form a substrate main body; and

covering the groove portion on the surface of the substrate main body with a covering member so as to form the substrate.